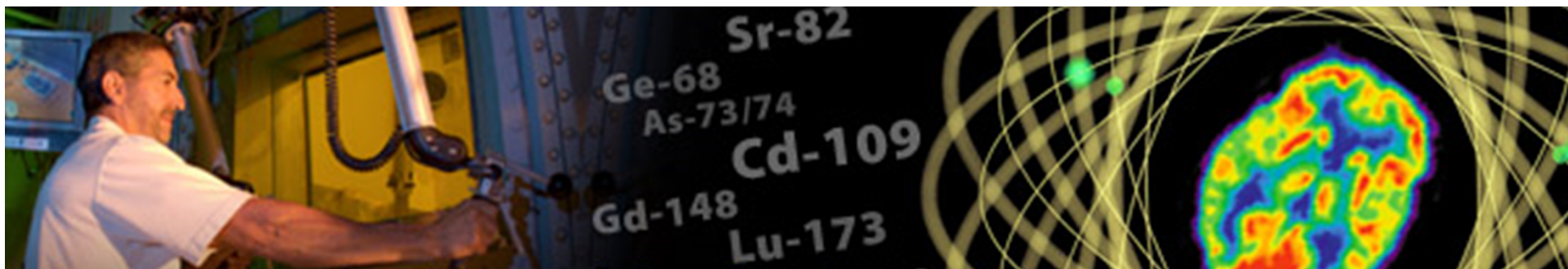




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OFFICE OF  
**SCIENCE**

# DOE Isotope Program Stable and Radioactive Materials



NMMSS Users Training Meeting  
May 2014

*Mr. Joel Grimm*  
*DOE Isotope Program*  
*Office of Nuclear Physics, Office of Science, U.S. Department of Energy*

# Mission

The mission of the DOE Isotope Program is threefold:

- Produce radioactive and stable isotopes that are in short supply
- Maintain infrastructure
- Conduct R&D on new and improved isotope production

Produce isotopes that are in short supply only – we do not compete with industry

**FY2013:**  
**>470 shipments supporting**  
**>225 customer orders**



*Isotope Production  
Facility (LANL)*

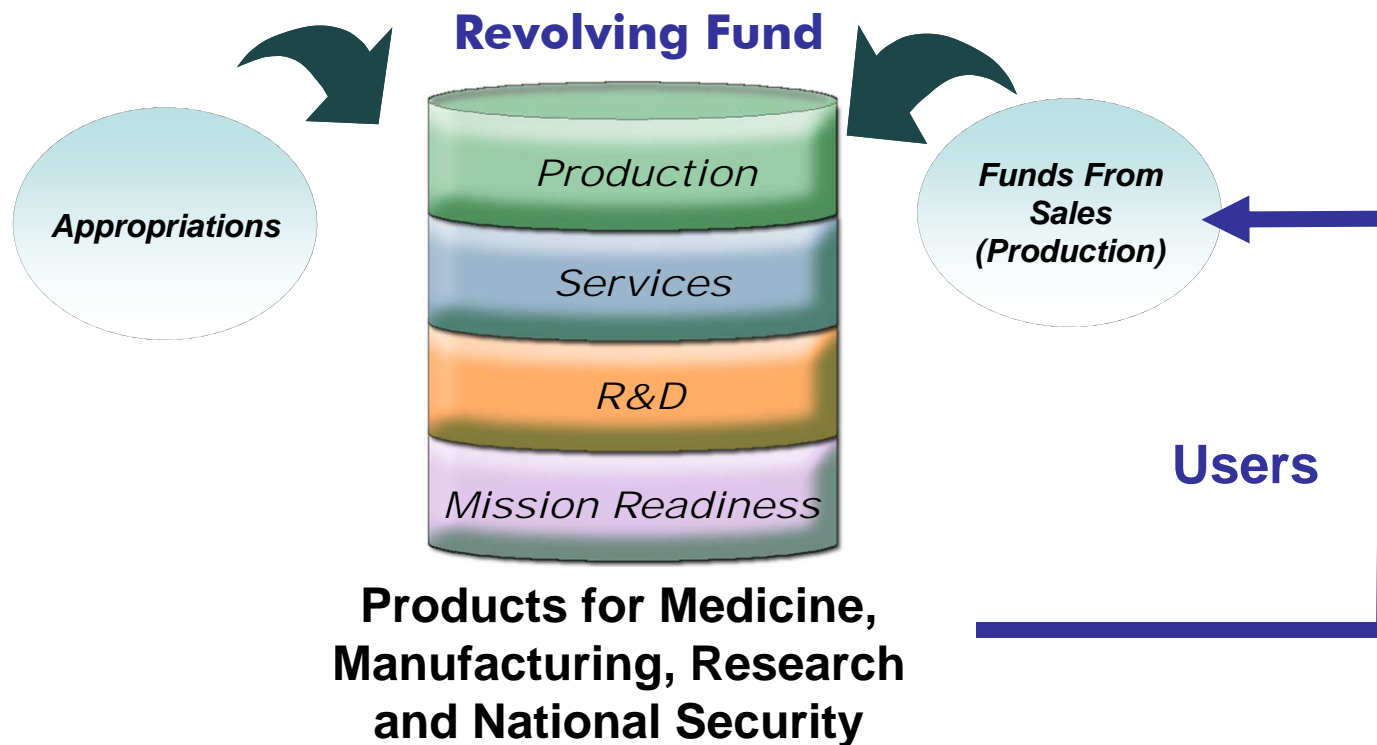


*Brookhaven Linac  
Isotope Producer*



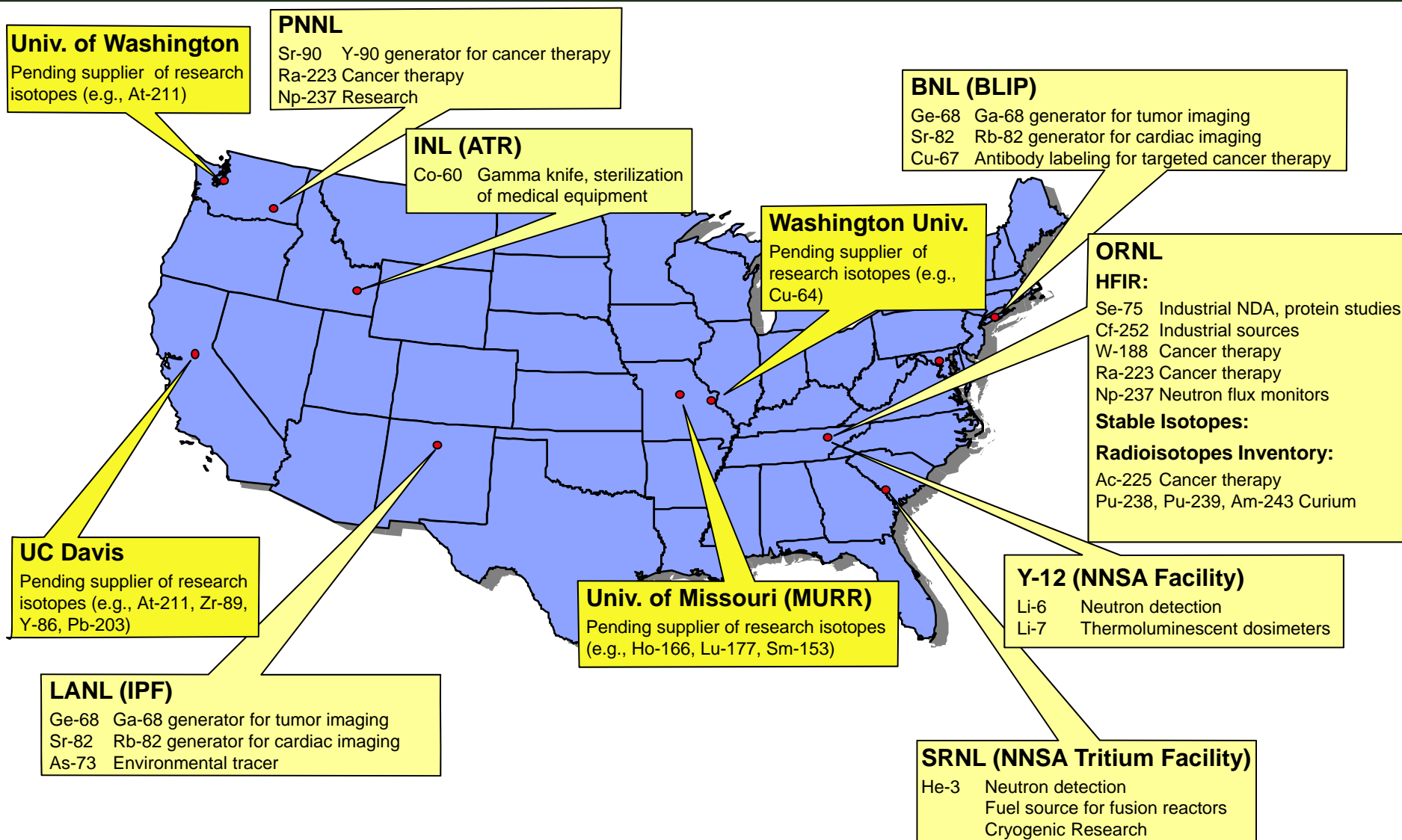
# Resources

- Public Law 101-101 creates Isotope Production Fund
- Allows prices based on cost recovery, market value, U.S. research needs, and other factors.





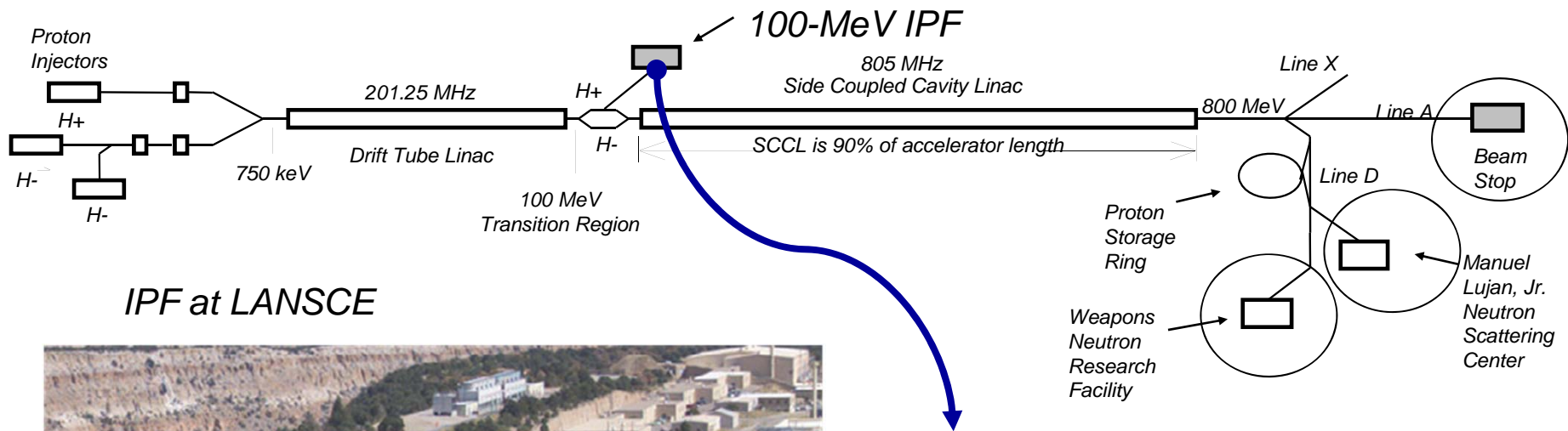
# Integrated Production Sites







# Accelerator Production



*IPF at LANSCE*



- Diversion of 100 MeV proton beam to target station
- Irradiates targets while LANSCE operates for NNSA/BES



# Reactor Production

## ORNL High Flux Isotope Reactor:

- High neutron flux
- Several hot cell facilities
- Cf-252, W-188, Ni-63, Se-75



## INL Advanced Test Reactor

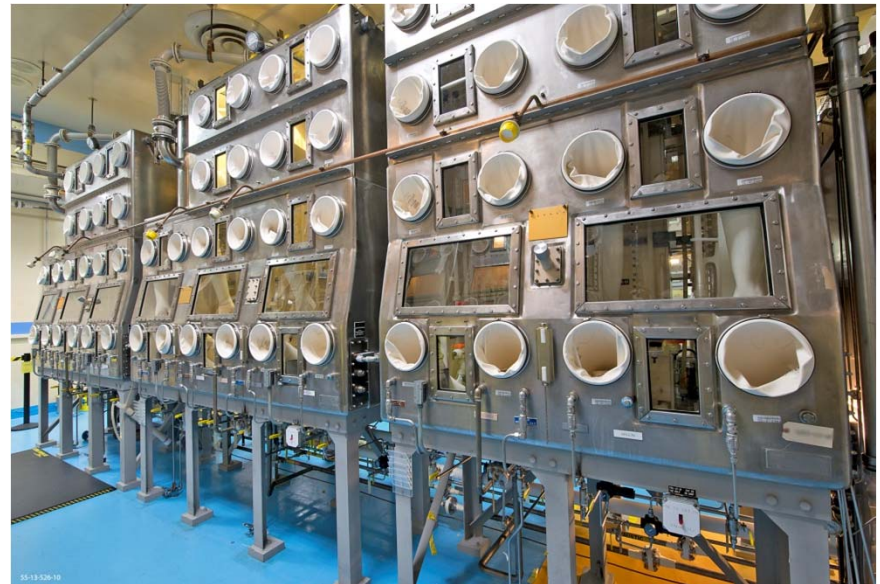
- Moderately high neutron
- Hot cell facilities
- Key Isotope: Co-60





# NNSA Surplus Materials

- **NNSA Byproducts**
- **Stable and Radioactive**
- **Decay and Activation Products from Stockpile Stewardship**
- **Accountable and non-Accountable**





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## National Isotope Development Center

- The NIDC and Isotope Business Office
- Coordinates all DOE distribution of isotope products and services
- Sales contract Management
- [www.isotopes.gov](http://www.isotopes.gov)
- [isotopes@ornl.gov](mailto:isotopes@ornl.gov)







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# Enriched Stable Isotopes

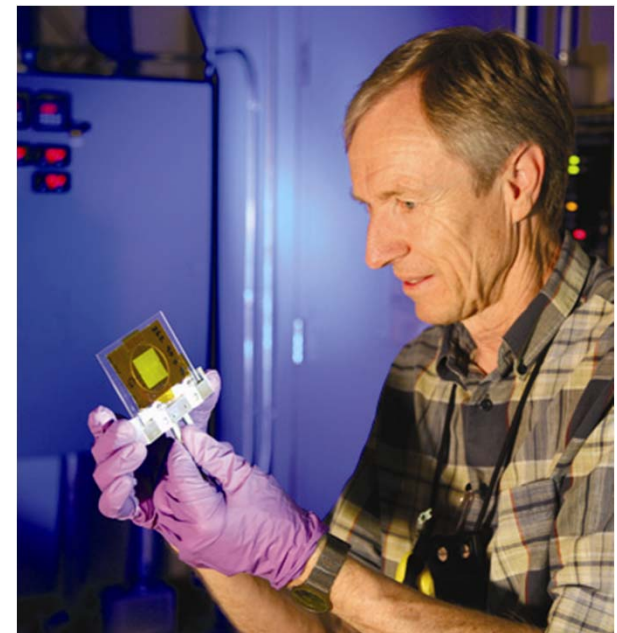
- Isotope Program manages inventory sales from Y12 Calutrons
- Developing new stable isotope separation technology
- Transition from R&D to prototype production facility – Start of fabrication in December 2013





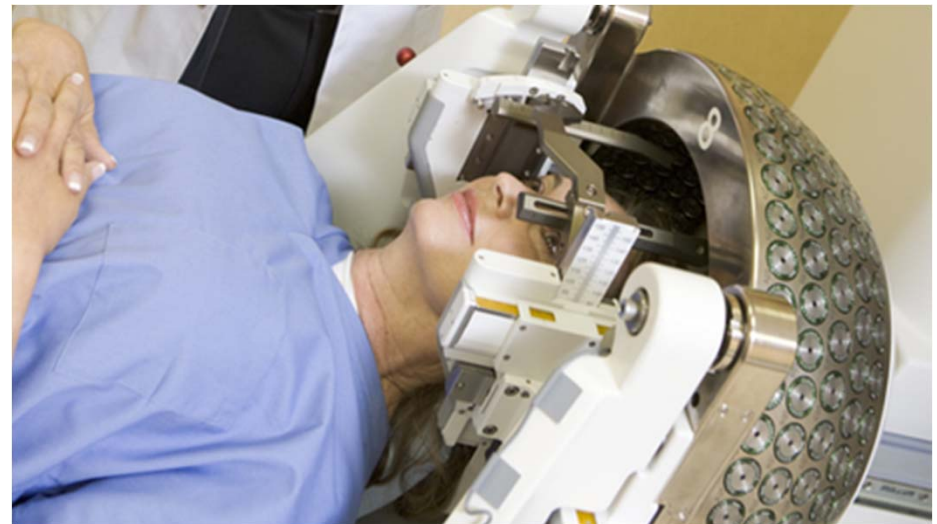
# Targeted Radiotherapy

- **Revolutionary Cancer Treatment**
- **Engineered Antibodies Take Alpha Emitters Directly into Tumor Cells**
- **Focus is on Using Th-232**
  - Target for Ac-225 production
  - Production Research Under Way at Los Alamos and Brookhaven
- **Supporting Clinical Trials and other Research**



# Cobalt-60

- Co-60 used for Gamma Knife surgery and gamma radiography
- 2012 Target failure at INL impacted production
- Isotope Program conducting multi-lab re-design of targets
- Priority in program to re-establish production





# Helium-3

- **Global Supplier**
- **Cryogenics, Research and Neutron Detector Manufacturing**
- **Savannah River Tritium Recovery Operations**
- **2008 Shortages Addressed by High-Level Interagency Policy Group**
- **Demand now Stands at Less than 10,000 Liters Annually**
- **7,000 Liters allocated to Federal Research Users Annually**
- **Periodic Auctions Provide Another 4,000 Liters to Commerce**



# Lithium-6 and -7

## Lithium-6

- Key Replacement Material for He-3 Neutron Detectors
- Y12 Produces and Distributes Metal

## Lithium-7

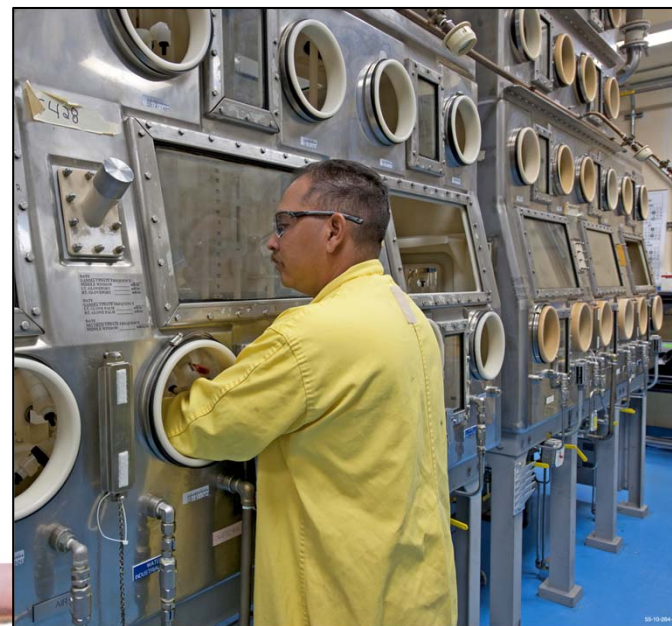
- Limited NNSA Reserve at Y12
- Thermo-luminescent Dosimeters
- Power Reactors -- Coolant Chemistry
- Foreign Producers
- Growing Global Demand
- Reserve for Isotope Sales





# Americium-241

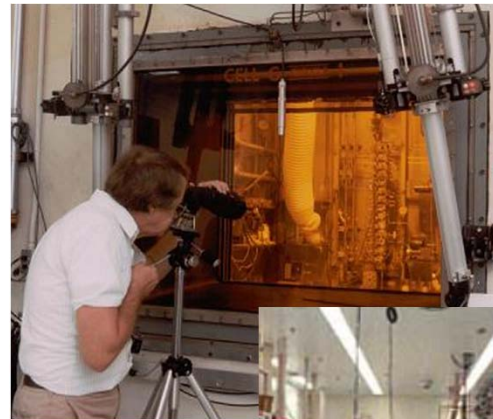
- Well Logging Industry Completely Reliant upon Foreign Imports
- Extracted Plutonium Processing Residues at LANL
- 3.5 Kilograms
- Sealed Source Manufacturers





# Californium-252

- Produced by Curium Irradiation at ORNL
- Provide Cf-252 through dedicated sales contracts with sealed source manufacturers
- Neutron sources for industrial, research, medical, homeland security and defense applications.





# Other Accountable Actinides

- Mixed Oxides and Metals in Inventory
- Pu-240, -241, -243, -244
- Am-243, Curium, Np-237
- From Weapons Development and Testing
- Unique Materials
- Many Unprocessed Targets
- Needed for CRMs and Other Uses

